Polymer Concrete

We shape concrete

Machines, moulds and
special equipment for
concrete precasting industry

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Why Polymer Concrete?

Polymer Concrete has for decades proven its worth as a material for industrial applications and pipelines that can withstand aggressive chemical attack and take high mechanical loads. Rationalised pipe production and technically mature pipe connections have enabled to use the corrosion - resistant polymer concrete for municipal sewage management applications.

Polymer Concrete is a concrete type with a polyester resin matrix. The resin alone provides for the binding function without using any cement. In combination with the strong quartzite aggregate it creates the high compressive and bending strength that allows the use of the pipes under large earth and traffic loads. The mature casting technology ensures dimensional accuracy and smooth surfaces, making Polymer Concrete a high-performance, cost-efficient sewer material with a long service life.

Microtunnelling, the technology for the future

Successful pipe installations depend on quality pipe

Microtunnelling technology has developed rapidly in recent years and reached a high standard worldwide because it is environmentally friendly and cost-effective. Microtunnelling projects to be successful require high-quality, high strength jacking pipes which are easy to install.

Polymer concrete – the ideal sewer material

Polymer concrete jacking pipes are made up of aggregate, filler and polyester resin instead of cement and water. Polyester as bonding agent provides excellent resistance to corrosion. The material properties and dimensions are specified in German Standard DIN 54815.

The material is commonly called polymer concrete (PRC for “Polyester Resin Concrete”). This composite material conforms with DIN 16946, part 2, type 1140. The homogeneous bond of resin and aggregate materials provides very high axial compressive strengths and bending strengths. The pipes also meet the requirements of ASTM D 6783.

Other advantages of the material include:

Polyester is extremely resistant to most acid and caustic solutions. The quartz aggregate resists chemical attack. The material structure is capillary-free and does not allow water absorption or gas diffusion.
These features make polymer concrete jacking pipes resistant to sewage, gases, corrosive solutions and aggressive soil (pH range 1,0 to 12).

The polymer concrete jacking pipe

Pipes are usually manufactured up to 3 meter lengths depending on pipe diameter and jacking equipment requirements. Connections to manholes are manufactured in shorter lengths in accordance with the requirements of the client. Production in special heatable steel moulds ensures accurate size and smoothness of the interior and exterior pipe surfaces. The inner pipe diameter is identical with the nominal diameter (DN). The outer pipe diameter is compatible with most standard microtunnelling and jacking equipment and can be adapted to meet specific structural requirements and machine sizes.

Reliable and safe

Polymer concrete jacking pipes meet the requirements of Standard A 125 of DWA (German Association for Water, Waste Water and Waste), formerly ATV. This standard requires parallel pipe ends perpendicular to the pipe axis. This is guaranteed by precise machined mould equipment, which is special designed for polymer concrete pipe manufacturing.

Parallel pipe ends perpendicular to the pipe axis ensure an even distribution of jacking forces over the entire pipe wall. The exterior pipe surface is very smooth which lowers friction during pipe jacking.

Pipe quality should be monitored in accordance with the quality control and testing regulations of any institute, which is specialised in this field.

All polymer concrete jacking pipes used in Germany and exported worldwide are required to obtain this approval. The maker need to prepare the static calculation based on DWA-Standard A 161. The installation requirements should be indicated in as much detail as possible.

Jacking pipe joints

A sealing element and a fitting from GRP or Steel make up the jacking pipe joint. For diameters smaller than DIA 1000 the fitting will be pressed only the seal. For diameters larger than DIA 1000 it is fix mounted on one side of the pipe. For diameter DIA 1000 both versions are available.

The fitting material should be proven and specified by DWA-Standard A 125. The quality of the pressure distribution ring is essential for the even distribution of axial forces on the pipe. Chipboard or knot-free softwood rings are used to distribute the jacking forces on the end of the pipe. The pressure distribution rings are supplied with the pipe and can be installed on request.

The full range

Polymer concrete jacking pipes DIA 250 – 900 for microtunnelling

With polymer concrete jacking pipes it is possible to microtunnel two manhole reaches at one time – with subsequent installation of a manhole midway between the two manholes. The superior capacity of polymer concrete jacking pipes to carry high compressive loads allows this time and cost saving procedure. A steel fitting provides the optimum in safety for a flawless pipe connection, even with unfavourable ground conditions.

Polymer concrete jacking pipes DIA 1000 – 2600

The high jacking load capacity of polymer concrete jacking pipes makes very long drives possible. To achieve still longer drives intermediate jacking stations are used. For polymer concrete jacking pipes you need intermediate jacking stations, including the specially designed leading and trailing polymer concrete interjack, the steel guide collar, and the steel and wooden pressure distribution rings. The microtunnelling/jacking equipment supplier will provide the hydraulic jacks. Bentonite is usually injected through injection nipples in the pipe wall to reduce surface friction. The injection nipples are installed in the polymer concrete jacking pipe in the plant. The nipples can be our design, made to customer specification or be supplied by the customer to use for installation.

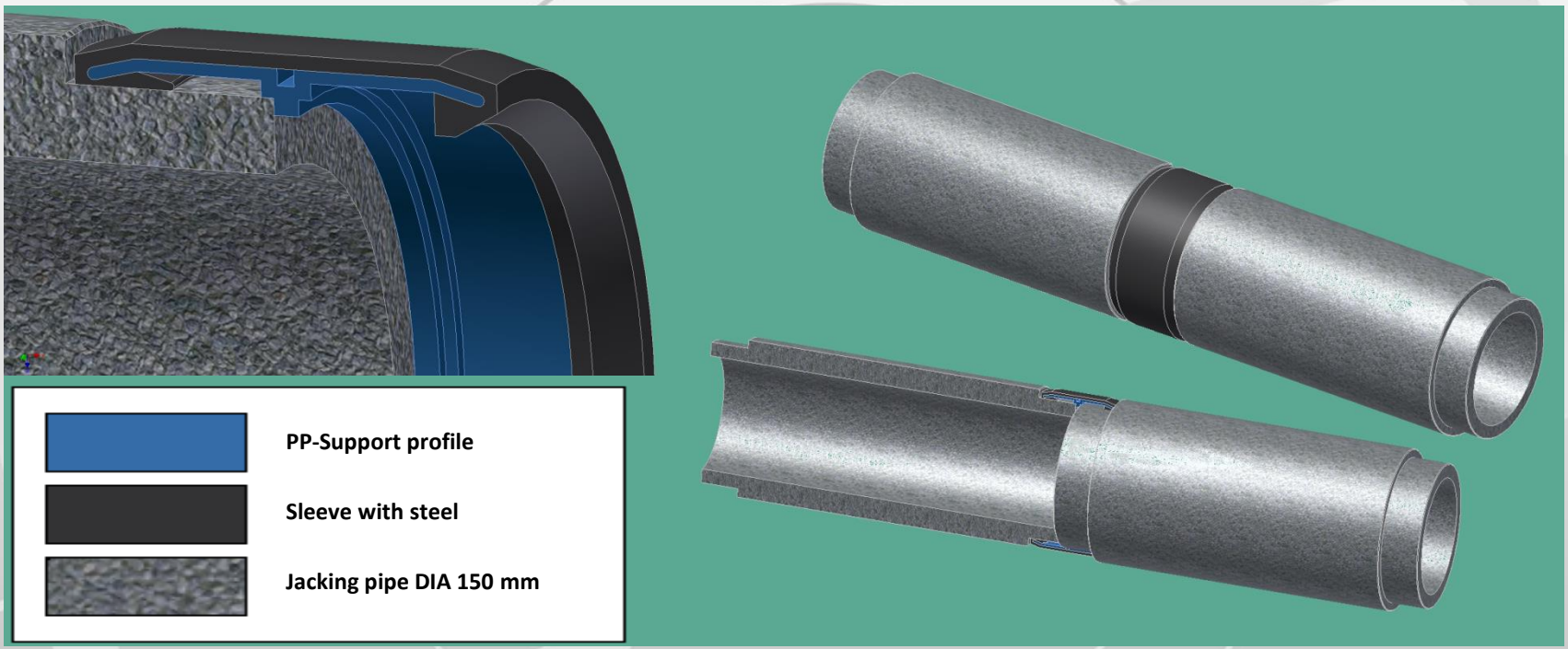
Polymer concrete jacking pipes DIA 800 – 1800 with kite-shaped cross-section

The jacking pipe with kite-shaped cross-section was developed in Hamburg to meet the specific hydraulic requirements of that city. Compared to a pipe with a circular cross-section this new jacking pipe ensures a higher flow speed at low water levels, increasing the self-cleaning effect. Old Hamburg egg-shaped brick sewers are replaced by polymer concrete jacking pipes with a kite- or egg-shaped cross-section.

Polymer concrete jacking pipes stand out for:

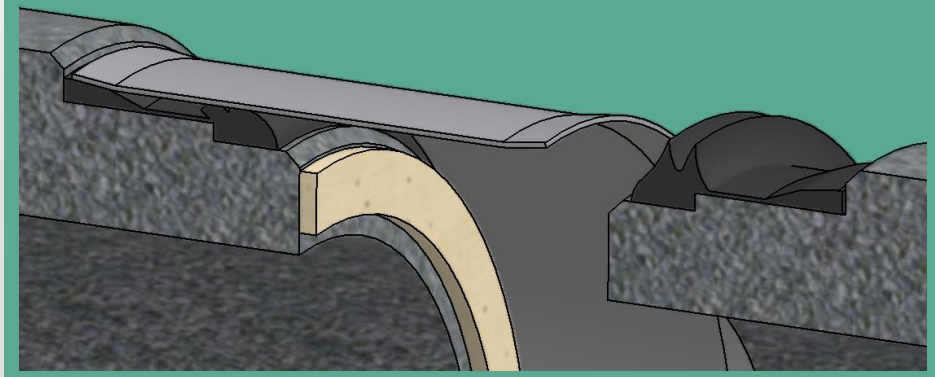
- High compressive strength = high jacking force and maximum safety
- Steel guide collar = maximum safety during jacking,
- GRP guide collar = reduced costs by also reduced jacking safety
- Smooth, even, non-absorbing outer pipe surface = reduced friction
- Parallel pipe ends = uniform distribution of jacking forces
- High dimensional accuracy = no ovality, tight joints and perfectly matching pipes
- Elasticity = reduced point loads and lower risk of rupture
- Low weight = ease of installation
- Adaptable dimensions = suitable for all microtunnelling and jacking equipment
- Smooth, even inner surface = high flow rate
- High corrosion resistance = reliability throughout a long service life
- Tested fatigue strength under cyclic load = installations under German, Canadian and U.S. railroad tracks

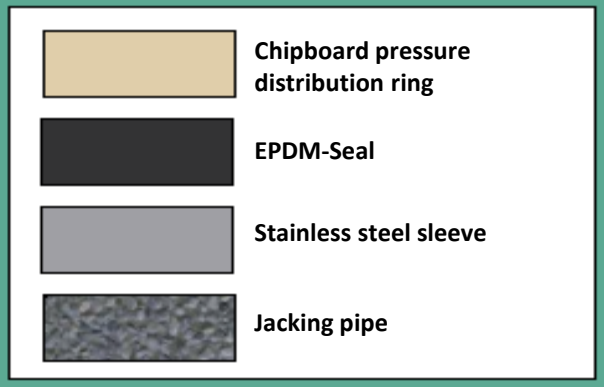
Jacking Pipes DIA 150 mm



Internal diameter	External diameter	Wall thickness	Length	Permitted comprehensive force		Weight
mm	mm	mm	m	t		Kg/m
150	208	29	1	20	200	37,5

Jacking Pipes DIA 200 - DIA 900 mm

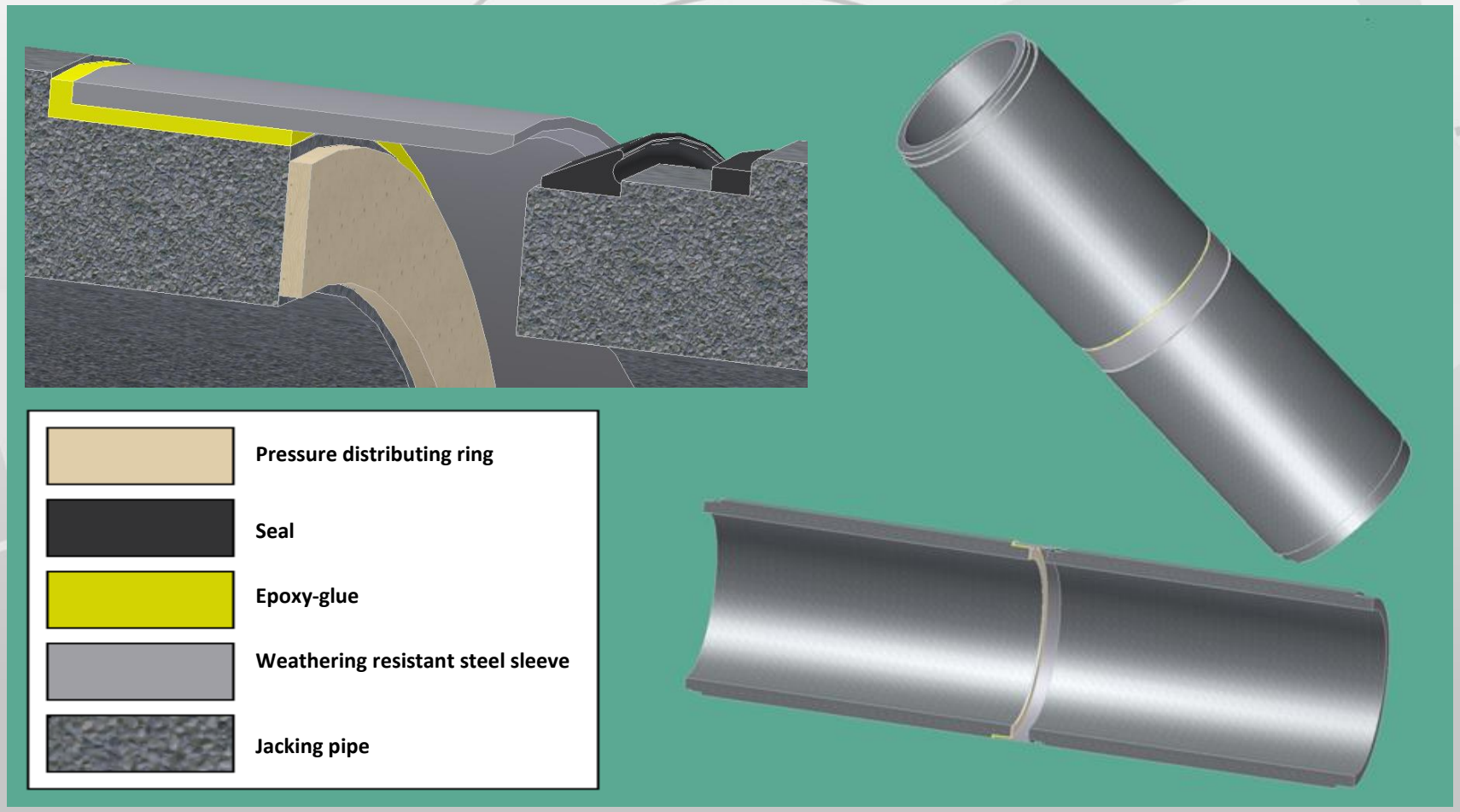




Jacking Pipes DIA 200 - DIA 900 mm

Internal diameter	External diameter	Wall thickness	Length	Permitted comprehensive force		Pipe weight
mm	mm	mm	m	t	kN	kg/m
200	275	37,5	1	21	210	62
250	360	55	1 and 2	53	530	117
300	400	50	1 and 2	51	510	122
400	550	75	1 and 2	150	1500	129
500	660	80	2	190	1900	324
600	760	80	2	224	2240	380
700	860	80	2	240	2400	435
800	960	80	2	272	2720	490
900	1100	100	2	448	4480	700

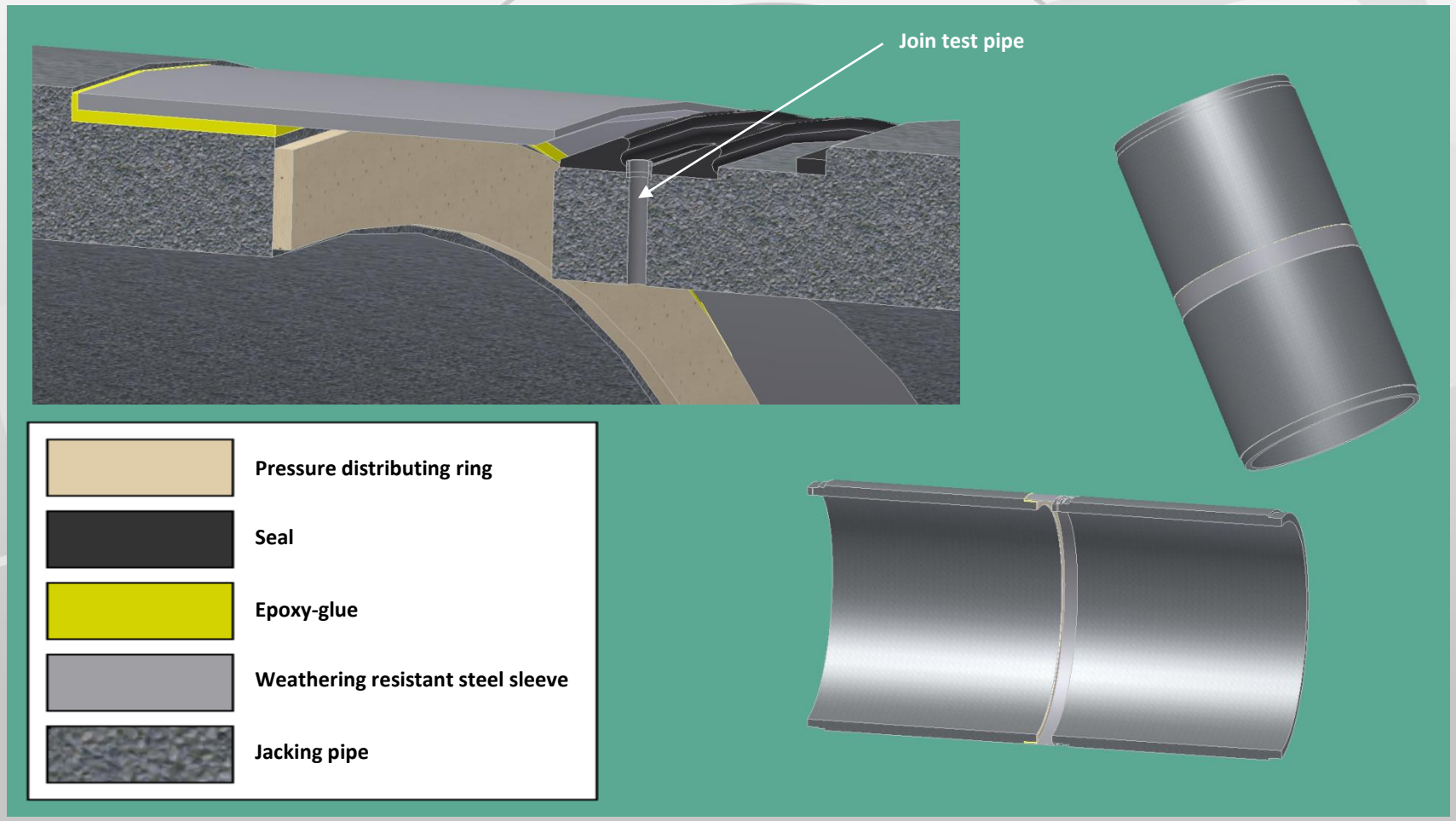
Jacking Pipes DIA 1000 - DIA 1800 mm



Jacking Pipes DIA 1000 - DIA 1800 mm

Internal diameter	External diameter	Wall thickness	Length	Permitted comprehensive force		Pipe weight
mm	mm	mm	m	t	kN	kg/m
1000	1184	92	3	414		700
1200	1482	141	3	570	5700	1319
1400	1720	160	3	740	7400	1740
1600	1940	170	3	890	8900	2100
1800	2160	180	3	890	8900	2486

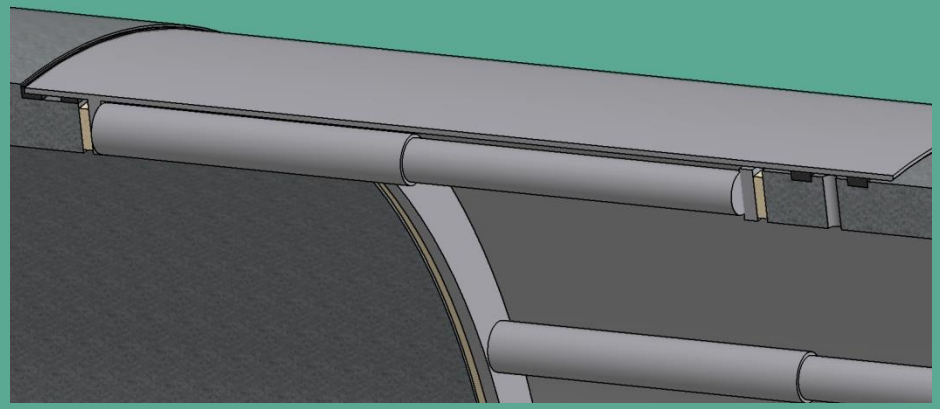
Jacking Pipes DIA 2000 – DIA 2600 mm

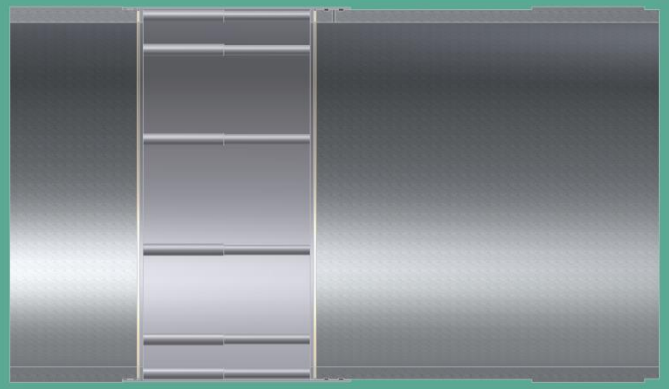


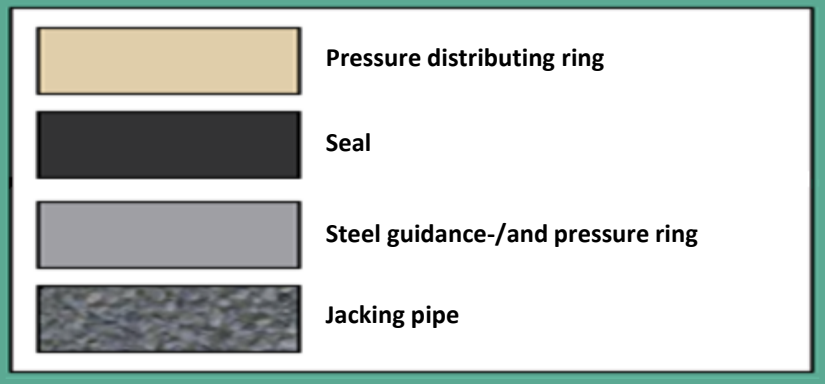
Jacking Pipes DIA 2000 – DIA 2600 mm

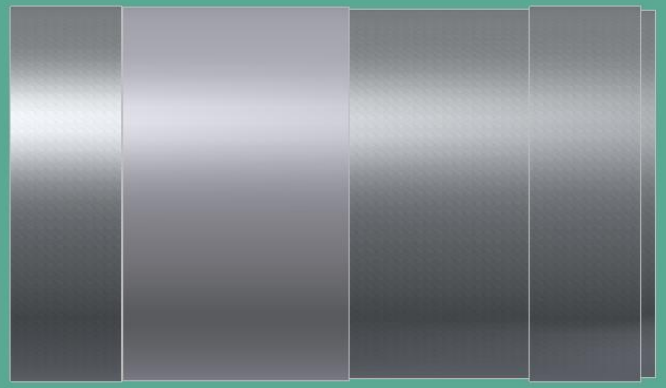
Internal diameter	External diameter	Wall thickness	Length	Permitted comprehensive force		Pipe weight
mm	mm	mm	m	t	kN	kg/m
2000	2400	200	3	1380	13800	3069
2200	2630	215	3	1670	16700	3621
2400	2870	235	3	2060	20600	4320
2600	3100	250	3	2415	24150	4969

Intermediate Jacking Station

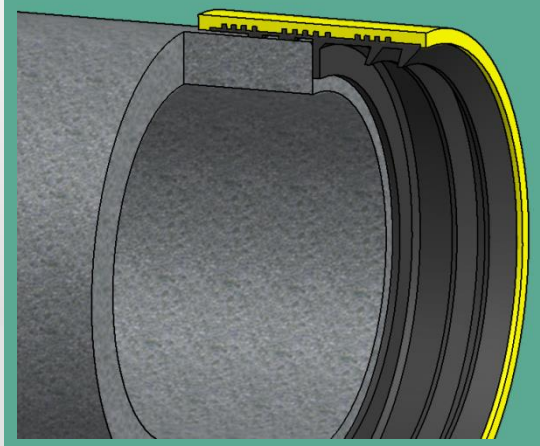


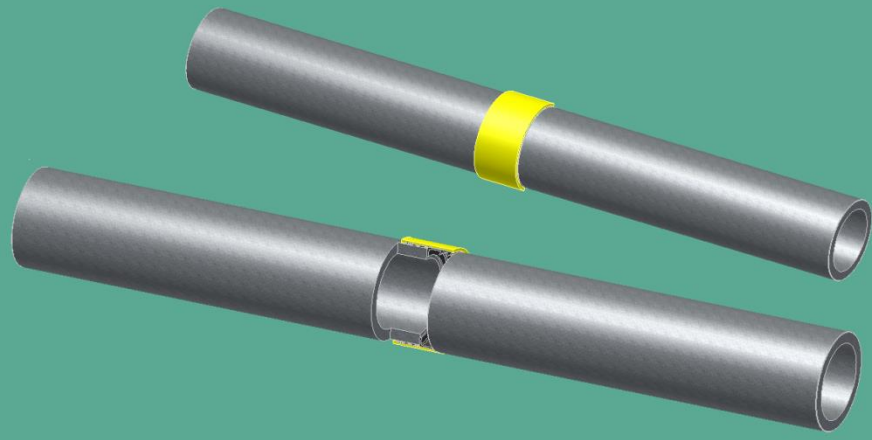


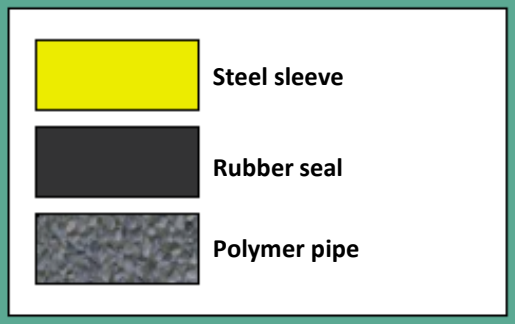




Polymer Pipes

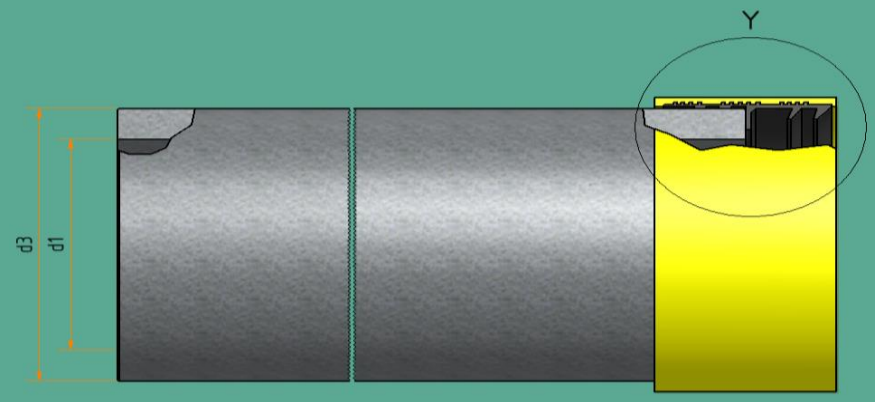




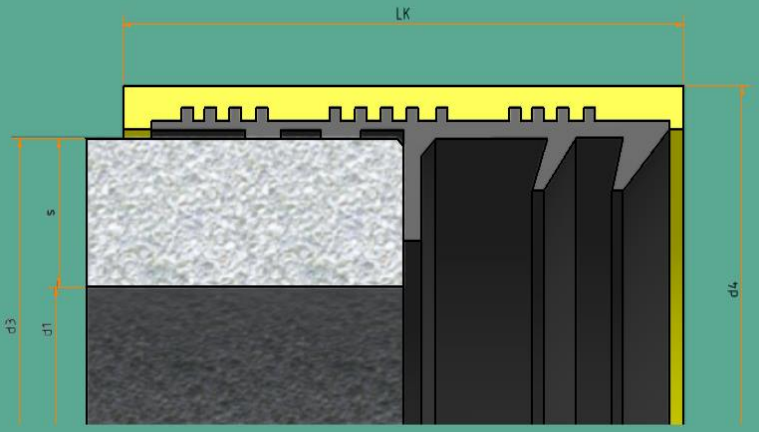


Internal diameter mm	External diameter mm	Wall thickness	Length	Pipe weight kg/m
300	388	44	3	107
400	500	50	3	160
500	605	52,5	3	206
600	711	55,5	3	258
700	821	60,5	3	327
800	925	62,5	3	383
900	1038	69	3	475
1000	1145	72,5	3	552
1200	1380	90	3	824

Polymer Pipes



Separate part Y:



Polymer Pipes

Dimensions for Polymer Pipes

DIA = d_1	Limit dimension	d_3	Limit dimension	S	Limit dimension	Length	Limit dimension	Pipe weight kg/m	L_k	Limit dimension	min. d_4	Weight step t	Trans-port-anchor
300	± 4	388	± 4	44	± 3	3000	± 1 %	107	200	± 10	419	0	0
400		500		50				160			530		
500	± 5	605	± 5	52,5				206			634		
600		711		55,5	± 4			258			741		
700	± 6	821	± 6	60,5				327			853		
800		925		62,5				383			958		
900		1038		69				475			1072		
1000		1145		72,5				552			1177		
1200	± 10	1380	± 10	90	± 6			824	250	± 15	1423	4	2
1400		1670		135				1471			1714	4	
1500		1790		145				1694			1835	5	
1600		1910		155				1931			1956	5	
1800	± 12	2130	± 12	165	± 7			2302			2167	7,5	
2000		2400		200				3124			2439	10	
2200		2640		220				3780			2685	10	

Polymer concrete properties:

Material know-how and manufacturing technology

Polymer concrete exists to the prevailing part of course seeming mineral raw materials, as for example quartz, basalt and granite. They are bound in the form of sand and gravels of certain grain dimension compositions (sieve lines) with a synthetic resin matrix.

Polymer concrete is poor in pores and disposes of an impervious and capillary-free structure, in contrast to normal concrete. Thus polymer concrete is suited on account of his natural resistance by most chemical liquids in a PH area from 1 - 12 excellently for the food industry, slaughterhouses, breweries, filling stations and canal pipes (sewage pipes).

The special material composition and the most modern manufacturing technologies lend his prominent quality profile to polymer concrete:

Water admission
With polymer concrete the water admission amounts less than 0,5 %, i. e. the material is frost-insensible.

Resistant to chemicals

Polymer concrete is impervious on grounds of his thick structure and is thereby resistant compared with most chemical liquids. PH factor 1-12.

Resistant to ageing
Thanks to his low water admission and the special recipe polymer concrete is absolutely frost-steady, UV-continual and rotting-steady.

Workable on
Polymer concrete can be worked on easily with the dividing disc, stone drill or chisel.

Ecologically friendly
Polymer concrete is an environmental-acceptable building material.

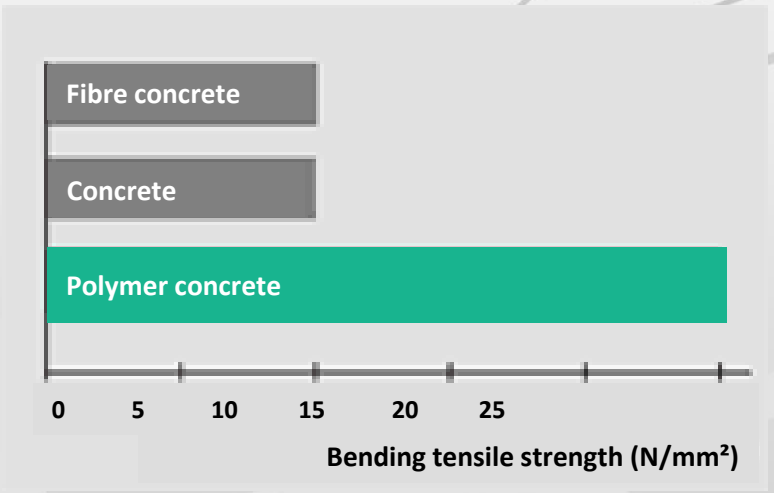
Weight savings
The unusual qualities of polymer concrete prove a construction method lighter up to 75 %, compared with concrete, with huge advantages for transport.

Smooth surface
The smooth surface of polymer concrete lets water and dirty particle run off fast and is light to clean.

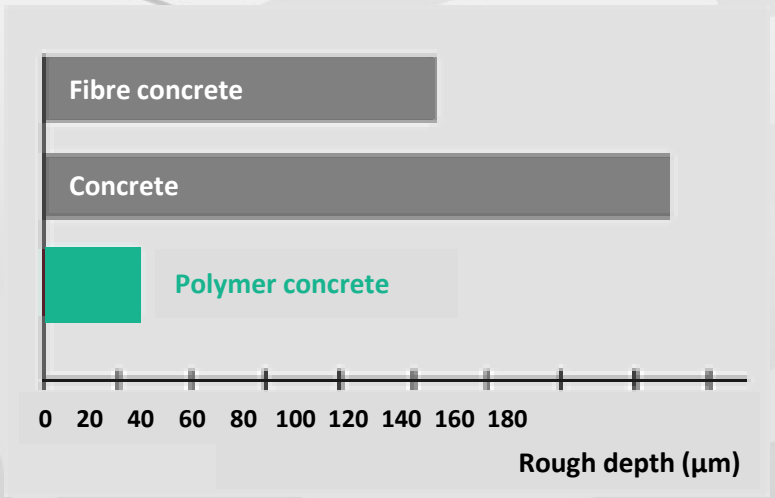
Disposal
Polymer concrete contributes by his extreme longevity to the waste avoidance, in addition, is able of recycling and can be led back in the production process.

Technical data

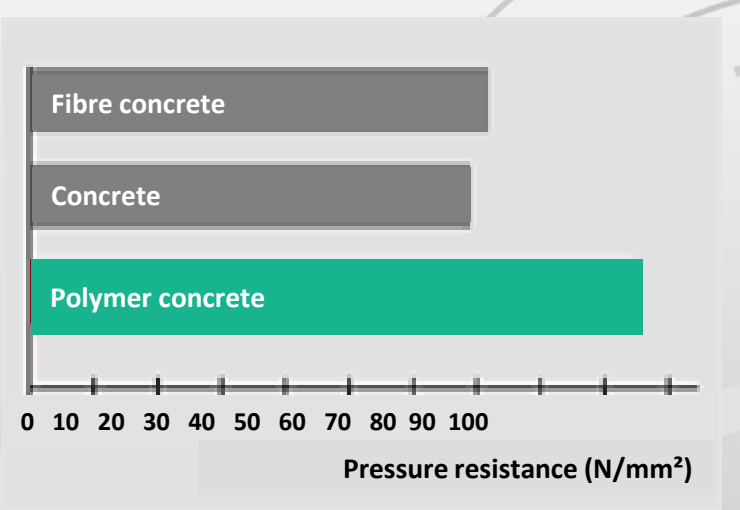
- Bending tensile strength > 22 N/ mm²
- Pressure resistance > 90 N/ mm²
- Elasticity module approx. 25 KN/ mm²
- Density 2,1 – 2,3 g/ cm³
- Water penetration depth < 0,5 %
- Chemical permanence high pH factor 1 – 12
- Rough depth approx. 25 µm
- Warm stretch approx. 0,018 mm/ m/ °C



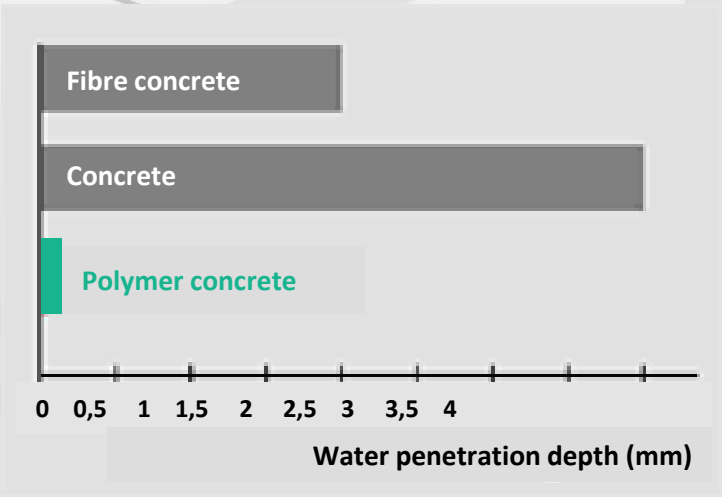
Bending tensile strength different materials for drainage channel



Middle rough depths of drainage channels of different materials



Pressure resistances of different materials for drainage channels



Water penetration depth (German Institute for Standardization 4281) of different materials for drainage channels after 72 hours

Standard recipe:

- Filler (several factions) in the area 0 - 4 mm:
  from approx. 80 to 90 %
- Polyester resin (not prequickened):
  from approx. 10 %
- Hardener (peroxide):
  from approx. 1 to 2 %
- Accelerator (cobalt):
  from approx. 1 to 2 %

Material Characteristics:

spec. weight [γ_R]:		23 t/m³
Young's modulus [E_{RK}]:		28.000 N/mm²
bending tensile strength [σ_{RBZ}]:		min. 16 N/mm²
compressive strength [σ_D]:	min. 90 N/mm²	
abrasion resistance [α_m]:	max. = 0,5 mm	
wall roughness [k]:		max. = 0,1 mm
lateral contraction [v]:		0,37 [1]
long-term strength under pulsating stress [$2x\sigma_A$]:	6 N/mm²	
evidence [load alternation:	2×10^7	
frequency [Hz]:		12

Quality requirements acc. to DIN 54815 Part 1 and Part 2:

- material
- dimensions and tolerances
- appearance, form of delivery
- bending tensile strength
- compressive strength
- marking
- water tightness

Mould Equipment and Transfer Car System

Mould Equipment and Transfer Car System

Mould Feeding

Demoulding

Facility Requirement

Production Team